1. Suppose $\omega_1$ and $\omega_2$ are two symplectic forms on a compact manifold $M$ with $[\omega_1] = [\omega_2]$ in $H^2(M)$. Suppose $J$ is an almost complex structure on $M$ which is $\omega_1$-compatible and $\omega_2$-compatible. Show that $(M, \omega_1)$ and $(M, \omega_2)$ are symplectomorphic.

2. (Fiber connect sum, due to Gompf) Suppose $(Q, \omega_Q)$ and $(M, \omega_M)$ are symplectic of dimension $2n-2$ and $2n$ respectively ($Q$ compact), with two disjoint symplectic embeddings $j_1$ and $j_2$ of $Q$ into $M$. Let $\nu_1$ and $\nu_2$ be the (symplectic) normal bundles of the two embeddings. Suppose $c_1(\nu_1) = -c_1(\nu_2)$. Show that there exist neighborhoods $N_1(j_1(Q))$ and $N_2(j_2(Q))$ and a diffeomorphism $\phi: \partial N_1 \to \partial N_2$ such that $\#\phi M = (M - N_1 - N_2)/(x \sim \phi x)$ carries a symplectic structure.

3. Let $\Lambda_{Gr}(n)$ be the space of Lagrangian subspaces of $(\mathbb{R}^{2n}, \omega_0)$.
   (a) Compute the dimension of $\Lambda_{Gr}(n)$.
   (b) Compute $\pi_1(\Lambda_{Gr}(n))$.
   (c) Identify $\Lambda_{Gr}(1)$ with a well-known manifold (or in terms of well-known manifolds).
   (d) Identify $\Lambda_{Gr}(2)$ with a well-known manifold (or in terms of well-known manifolds).

4. Let $H = \sum_i x_i^2 + \sum_i y_i^2$ be a Hamiltonian function on $\mathbb{R}^{2n}$.
   (a) Identify the space of (primitive) periodic orbits of the associated Hamiltonian system restricted to the level surface $H = 1$. (Primitive means that the orbit is not a multiple cover of another orbit.)
   (b) For $n = 2$, show that there exists a small perturbation $\tilde{H}$ of $H$ with only two (primitive) periodic orbits on the level surface $\tilde{H} = 1$.
   (c) Repeat (b) with $n$ (primitive) periodic orbits for general $n$. 

1